Hilar Dissection versus the "Glissonean" Approach and Stapling of the Pedicle for Major Hepatectomies:

A Prospective, Randomized Trial

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Objective: A randomized study was conducted of hilar dissection and the "glissonean" approach and stapling of the pedicle for major hepatectomies to contrast their feasibility, safety, amount of hemorrhage, postoperative complications, operative times, and costs.

Summary Background Data: The "glissonean" approach is reported as requiring a shorter portal triad closure time; furthermore, the procedure seems to expedite the transection of the liver.

Patients and Methods: Between 1998 and 2001, 80 patients were enrolled in this study. The major liver resections included 15 extended right, 7 extended left, 42 right, and 16 left hepatectomies. The patients were randomly assigned to the hilar dissection group (G1; n = 40) or to the "glissonean" approach and stapling of the portal triad group (G2; n = 40).

Results: The groups were equally matched for age, sex, diagnosis, mean resected specimen weight, number of tumoral lesions, type of liver resection performed, and percentage of patients with margin invasion (G1: 4; 10% vs G2: 5; 12.5%). The duration of the 2 procedures was similar (G1: 247 ± 54 min vs G2: 236 ± 43 min; $P = 0.4$). However, the duration of the hilar dissection was shorter for G2 (50 ± 17 min) versus G1 (70 ± 26 min; $P < 0.001$). By contrast, the duration of pedicular clamping was shorter for G1 (43 ± 15 min) versus G2 (51 ± 15 min; $P = 0.015$). No differences were observed in the amount of hemorrhage (G1: 887 ± 510 mL vs G2: 937 ± 636 mL; $P = 0.7$), and only 6 patients in G1 and 10 in G2 were transfused ($P = 0.26$). Morbidity rates were similar for both groups (G1: 23% vs G2: 33%; $P = 0.3$). Surgical injury of the contralateral biliary duct was not observed. However, 3 patients in G1 and 4 patients in G2 presented a biliary fistula that resolved spontaneously. Postoperative hospital stay was similar (G1: 8 [range, 6-24] vs G2: 9 [range, 5-31] days; $P = 0.6$). The postoperative levels of alanine transaminase (ALT) during the 2 first postoperative days were lower for G1 than G2. Cost of the surgical material was 1235.80 US for G1 and 1301.10 US for G2.

Conclusions: The 2 techniques are equally effective procedures for treating hilar structures. Although *en bloc* stapling transection is faster, hilar dissection was associated with a shorter pedicular clamping time, less cytolysis, and the materials required were less expensive.

Key Words: adult, human hepatectomy/mt (methods), hospital mortality, liver neoplasms/su (surgery), neoplasms/sc (secondary)

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Hemorrhage is undoubtedly one of the main factors of death and morbidity in major liver resections.[1] Bleeding might occur mainly during transection of the hepatic parenchyma but can be reduced using the intermittent Pringle maneuver[2] or total vascular exclusion.[3] The amount of operative blood loss can be further reduced by dividing the corresponding vascular inflow of the liver before parenchyma transection to achieve hemihepatic devascularization.

The classic intrafascial or extrahepatic hilar approach involves the dissection of the appropriate branch of the portal vein, hepatic artery, and the hepatic duct outside the liver parenchyma. After isolation, the vascular and biliary structures are cut and ligated individually.[4]

The pioneering works of Launois[5] and Galperin[6] described the fibrous sheath that envelops the entire portal triad and extends into the liver. An alternative method of inflow control of the liver is the "glissonean" approach. This technique includes the dissection of the whole sheath of the pedicle directly after division of a substantial amount of the hepatic tissue to reach the pedicle, which is surrounded by a sheath derived from Glisson's capsule. The use of vascular staplers in this situation allows simultaneous ligation of the entire right or left portal pedicle.[7] It has been reported that the "glissonean" approach to the treatment of the hilum can

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reduce the portal triad closure time, can expedite the transection of the liver,[8] and reduce intraoperative hemorrhage.[9] Reported benefits, however, were based on comparison with historical controls, and so evidence favoring one technique over the other is inconclusive.[10]

To date, the procedure used is likely to depend on the surgeon's training or preference rather than on objective data. There has been no prospective, randomized study to determine whether the procedures for treating hilar structures influence the clinical evolution of the patient. To address this issue, we designed a prospective, randomized, controlled trial comparing the separate transection of the structures of the portal triad at the level of the hilum and *en bloc* transection using the "glissonean" approach and a surgical stapler in patients undergoing major hepatectomies. The main objective was to evaluate the feasibility, safety, amount of hemorrhage, and postoperative complications of the 2 procedures. A secondary objective was to determine their respective operative time and costs.

PATIENTS AND METHODS

The protocol received the approval of the research review board of our hospital, and informed written consent was obtained from each patient before surgery.

Between September 1998 and December 2001, 323 patients underwent a liver resection in the Department of Surgery, Hospital de Bellvitge, University of Barcelona, Spain. Of these patients, 151 underwent major liver resection involving more than 3 segments, according to Couinaud's nomenclature.[11] Of these, 80 were enrolled in this study because they fulfilled the following inclusion criteria: elective major liver resection for malignant tumors, no other major associated surgical procedures, the liver parenchyma was noncirrhotic, and preoperative imaging studies discarded involvement of the main portal bifurcation. Seventy-one were excluded: 19 patients with Klastkin tumor because hepatectomy included lymphadenectomy and resection of the biliary tree, 10 patients with hepatocellular carcinoma or cholangiocellular carcinoma because of associated chronic hepatitis, in 8 cases the patients presented bilateral liver metastases, in 7 patients hepatectomy for synchronous liver metastases was associated with simultaneous resection of colorectal carcinoma, in 7 cases the tumor was too near to the hilus to be suitable for the "glissonean" approach, in 6 cases hepatectomy was performed for benign tumors, 5 patients were excluded because of preoperative portal vein embolization, in 4 patients the tumor was near to the vena cava and total vascular exclusion was performed, and in 5 cases as a result of miscellaneous causes (previous hepatectomy, abdominal trauma, associated nephrectomy, gallbladder carcinoma, or metastases of gastric carcinoma).

The patients included in the study comprised 56 men and 24 women, with a median age of 64 years (range, 42-80 y). The indications for liver resection were metastases of colorectal carcinoma in 73 patients, hepatocellular carcinoma in 1 patient, peripheral cholangiocellular carcinoma in 1 patient, and metastases of miscellaneous tumors (breast [n = 2], kidney, leiomyosarcoma, and ovarian carcinoma).

Major liver hepatectomies, according to the Brisbane classification,[12] included 15 extended right hepatectomies (resection of segments 4, 5, 6, 7, and 8), 7 extended left hepatectomies (resection of segments 2, 3, 4, 5, and 8), 42 right hepatectomies (resection of segments 5, 6, 7, and 8), and 16 left hepatectomies (resection of segments 2, 3, and 4).

Because intraoperative ultrasonography might reveal new tumoral nodules and, therefore, lead to a change in the technique of surgical resection, potential study patients were not randomized until full hepatic exploration had been completed. Patients considered suitable for major liver resection, but with involvement of the main portal triad by the tumor, were discarded. The patients were randomly assigned to the hilar dissection (group 1; n = 40) or to the "glissonean" approach and stapling of the portal triad (group 2; n = 40).

Surgical Techniques

A subcostal incision or a midline incision with a right sagittal prolongation was used in all cases. After meticulous ultrasonographic study,[13] the liver was mobilized in a standard way. The gallbladder was removed and a catheter introduced in the cystic duct.

In group 1, the portal vein, hepatic artery, and biliary duct were dissected in the hilum by opening the peritoneal fascia. The corresponding portal vein was transected using vascular clamps and closed with a running suture with a nonabsorbable monofilament. The corresponding hepatic artery and the biliary duct were also ligated and cut before transection of the parenchyma (Fig. 1).

In group 2, control of the intrahepatic portal triad was achieved by hepatotomy near the corresponding portal pedicle. Before making a hepatotomy, a Pringle maneuver was performed to minimize blood loss. Either the right or left portal pedicle was isolated and secured using a large curved clamp and encircled with a rubber tape. The TA-30 vascular stapler (United States Surgical Corp., Norwalk, CT) was introduced to transect the pedicle. During transection a firm countertraction of the rubber tape is necessary to avoid accidental damage of the bile duct confluence[7] (Fig. 2).

Transection of the liver was performed under intermittent hepatic inflow occlusion.[2] Clamping of the portal triad was performed with the tourniquet technique using a rubber tape. Separate clamping of accessory left hepatic arteries was performed when present. Before February 2000, transection of the liver was performed using the "Kelly" clamp "crushing technique." After March 2000, in 33 patients, the "CUSA Excel" ultrasonic dissector (Valleylab Inc., Boulder, CO) was used to skeletonize portal branches and venous tributaries.

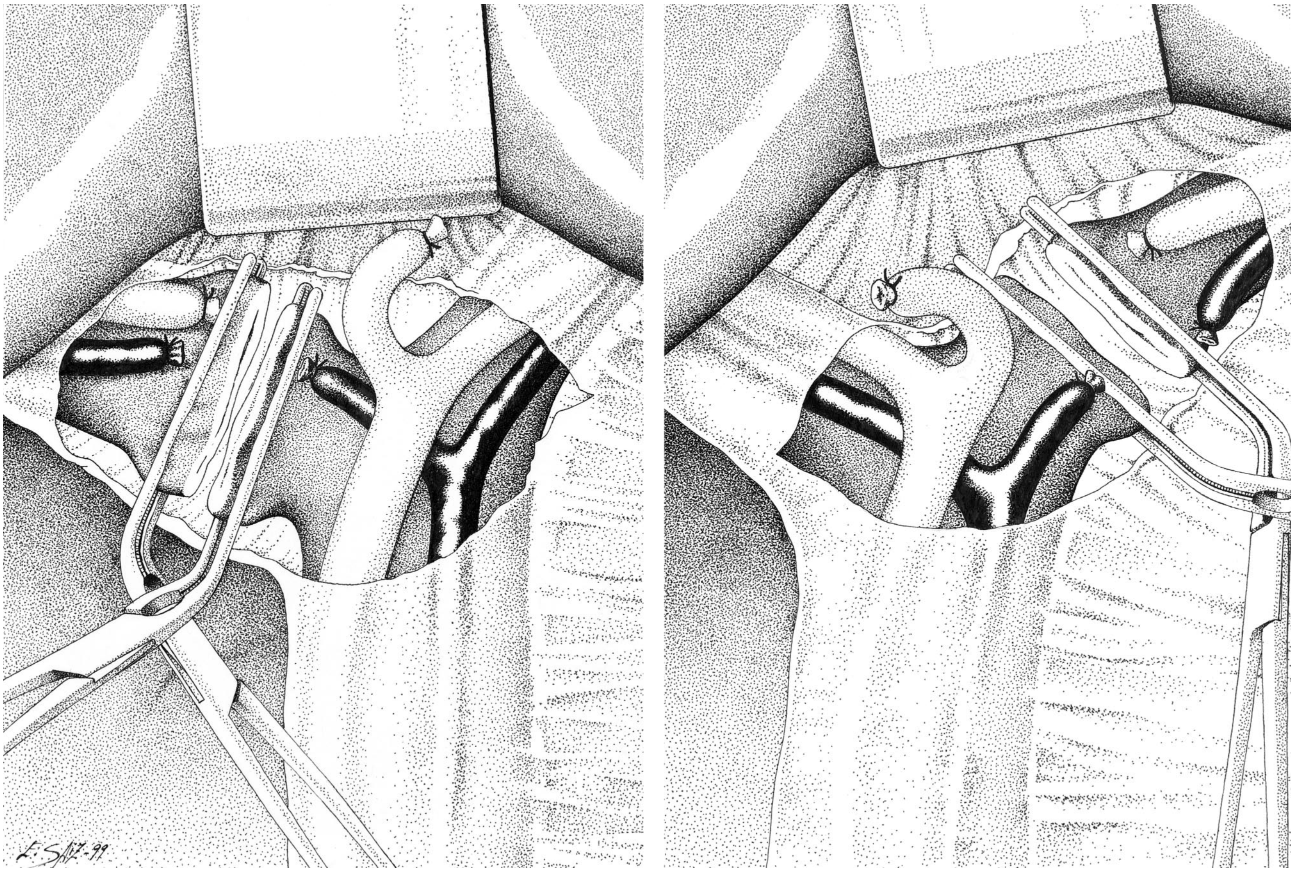

FIGURE 1. Hilar dissection technique. The corresponding hepatic artery and the biliary duct are ligated and cut. The corresponding portal vein is transected using vascular clamps and closed with a running suture with a nonabsorbable monofilament before transection of the parenchyma.

The major hepatic veins were controlled extrahepatically and transected using a surgical stapler[14] (Endo GIA 30 United States Surgical Corp.). Hemostasis was obtained with a monopolar irrigated electrocautery. Major vascular structures were ligated or secured with interrupted sutures. After resection, control of venous hemorrhage was optimized with the use of the argon beam coagulator (Valleylab Inc.). Biliostasis was achieved with the aid of dye injection in the biliary tree through the catheter of the cystic duct. The cut surface of the liver was sealed using fibrin glue. Closed suction drainage was used in all patients.

Study Design

Randomization was carried out using sealed envelopes placed in the operating room and were drawn sequentially. Patients were stratified by hepatectomy operation (right or left). The patient could be excluded from the study if the surgeon thought the tumor was too near to the pedicle to permit safe hepatotomy and the "glissonean" approach without violation of the tumoral margin.

For the purposes of this study, the operation was divided into the following 4 phases: 1) the hepatic mobilization phase, including laparotomy, ultrasonographic exploration, and liver mobilization; 2) the hilar transection phase, including cholecystectomy and transection of the vascular and biliary structures of the pedicle, either by hilar dissection or *en bloc* stapling using the "glissonean" approach; 3) the parenchyma transection phase with hilar clamping; and 4) the hemostasis phase, including hemostasis of the liver cut surface, biliary dye injection, and abdominal closure. The amount of blood loss was measured from the volume of blood collected in the container of the aspirator and the ultrasonic dissector and from the weight of the soaked gauze.

The patients were subjected to controls during the postoperative period with blood biochemistry on days 1, 2, 3, 5, and 7. All patients underwent ultrasonographic abdominal study and chest x-ray before leaving the hospital. Patient demographic data, complications, postoperative evolution, hospital stay, and results of histopathologic study were prospectively introduced in a computer database. All patients

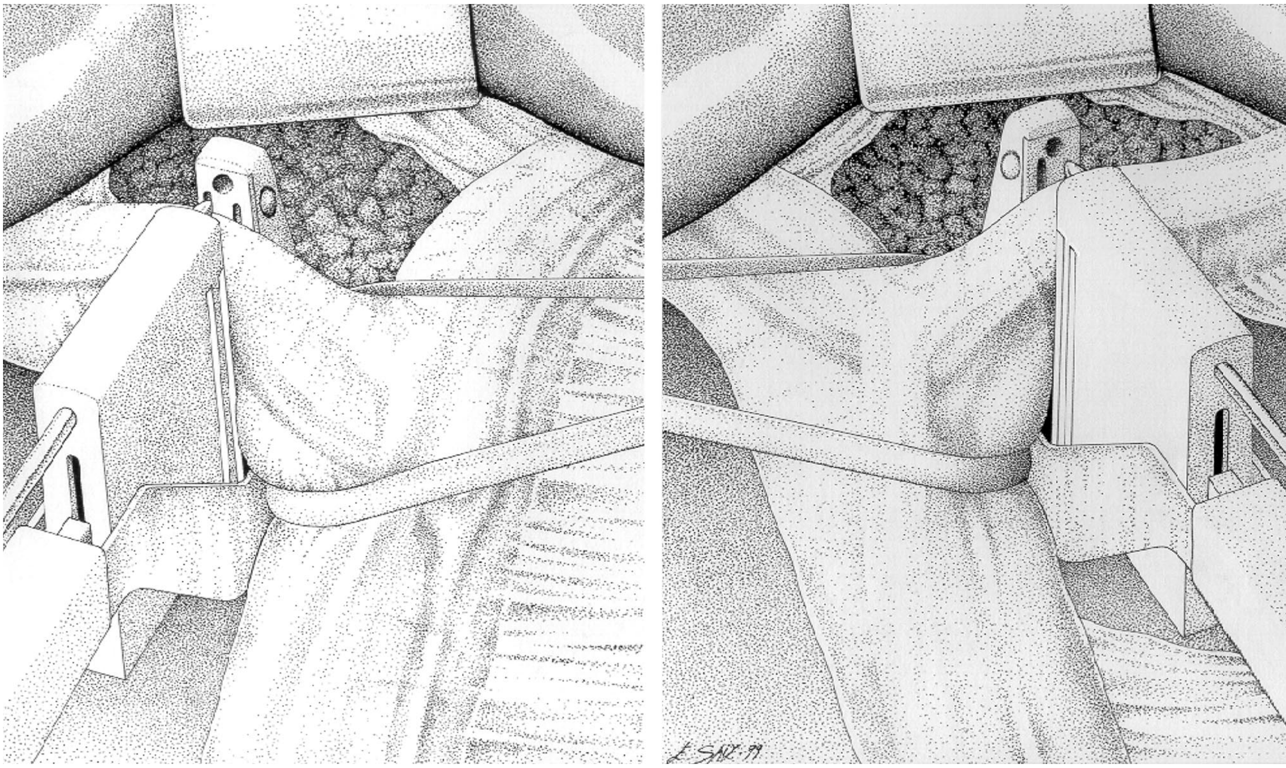

FIGURE 2. "Glissonean" approach technique. Control of the intrahepatic portal triad is achieved by hepatotomy near the corresponding portal pedicle. The TA-30 vascular stapler is introduced to transect the pedicle. During transection a firm countertraction of the rubber tape is necessary to avoid accidental damage of the bile duct confluence.

were followed in the outpatient clinic at 1, 3, and every 6 months thereafter with blood biochemistry and spiral CT scans of the abdomen. Biliary leak was defined as any drainage through the catheter with a bilirubin content higher than the plasma levels. All procedures were performed by 4 staff surgeons, each having experience with more than 50 major hepatic resections. There was an equal disposition for the 2 approaches among the 4 surgeons. However, at the end of the study, we were in general more comfortable with the "glissonean approach" because we thought it was easier to perform. There were no significant differences between the different surgeons related to the duration of the different phases of the operation, the hospital stay, or the transfusion.

Calculations of the cost of materials were based on the actual hospital cost for the materials and the standardized use of suture material and staplers by the surgeons. Data were analyzed on the intention-to-treat principle. Continuous data were analyzed using the Student *t*-test. The Fisher's exact test and the Pearson χ^2 test were used to analyze categorical data. $P < 0.05$ was considered statistically significant. All data analysis was performed on an IBM-compatible PC using SPSS 10.0 for windows (SPSS Inc., Chicago, IL). To calculate sample size we used the PS (Power and Sample Size) program by William D. Dupont and Walton D. Plummer.[15] Using a 2-sided test in a sample of 80 patients, with a probability of type I error (α) = 0.05, and a power = 0.8 is possible to detect differences of 20 minutes in operative time and 150 mL in blood loss.

RESULTS

The groups were equally matched according to age, sex, preoperative laboratory test, diagnosis, and histology of the nontumorous liver (Table 1). There were no significant differences between the 2 groups in terms of mean resected specimen weight, number of tumoral lesions, type of liver resection performed, technique of liver transection, or percentage of patients with margin invasion (group 1: 4 [10%] vs group 2: 5 [12.5%]). Additional procedures at the time of hepatectomy were: in group 1 minor resection of small liver metastases in the contralateral lobe (n = 4), resection of the middle hepatic vein (n = 3), partial resection of diaphragm (n = 2), and partial resection of the vena cava. In group 2 the additional procedures performed were minor resection of small liver metastases in the contralateral lobe (n = 10), takedown of ileostomy or colostomy (n = 2), repair of abdominal eventration (n = 2), and celiac trunk lymphadenectomy (Table 2).

TABLE 1. Clinical Characteristics of the Patients

	Hilar Dissection (n = 40)	Glissonean Approach (n = 40)	*P* Value
Age			
Mean ± SD	62.3 ± 9	62.7 ± 9	0.85
Median (range)	61.5 (47–80)	66 (42–78)	
Sex (M/F)	26/14	30/10	0.33
Preoperative lab tests			
Hematocrit (%)	38.6 ± 4.9	39.8 ± 4.1	0.29
Platelets × 10^{12} (cell/L)	229.3 ± 86	230.9 ± 72	0.93
Prothrombin time (INR)	0.99 ± 0.09	1.11 ± 0.48	0.15
AST (μKat/L)	1.15 ± 2.84	1.43 ± 5.3	0.79
ALT (μKat/L)	0.99 ± 1.9	1.08 ± 3.7	0.9
Bilirubin (μmol/L)	9.5 ± 3.7	8.6 ± 3.2	0.3
Alkaline phosphatases (μKat/L)	3.75 ± 8.2	4.02 ± 9.4	0.9
γ-Glutamil transpherases (μKat/L)	1.11 ± 0.93	1.61 ± 1.7	0.2
Creatinine (μmol/L)	88 ± 23	102 ± 43	0.12
Albumin (g/L)	40.4 ± 8.4	41.6 ± 3.7	0.46
Indications of resection, no. (%)			0.53
Metastases of CRC	38 (95)	35 (87.5)	
Hepatocellular carcinoma	1 (2.5)	0	
Cholangiocellular carcinoma	0	1 (2.5)	
Metastases of other tumors	1 (2.5)	4 (10)	
Histology of nontumorous liver			0.34
Normal liver, no. (%)	29 (72.5)	25 (62.5)	
Steatosis > 20%, no. (%)	11 (27.5)	15 (37.5)	

AST normal value <0.5 μKat/L; ALT normal value <0.9 μKat/L; alkaline phosphatases normal value 0.1–1.6 μKat/L; γ-Glutamil transpherases normal value 0.05–1.16 μKat/L.

SD, standard deviation; CRC, colorectal carcinoma.

Two of the 80 patients enrolled in the study, 1 from each group, had to be crossed over to the other group. In the hilar dissection group, 1 patient showed dense hilar adhesions as a result of the previous surgical removal of choledochal calculi, making hilar dissection dangerous. Liver resection required switching this patient to the "glissonean" approach, which was easily performed. The patient in the "glissonean approach" group demonstrated violation of the tumoral margin during hepatotomy for left portal triad isolation. In this patient, dissection of the isolated elements in the pedicle allowed ligation of the artery, portal vein, and biliary duct and completion of the hepatectomy without problems. However, these 2 patients were evaluated in their original groups in an intention-to-treat analysis.

Surgical Outcomes

There were no significant differences in the results of the intraoperative procedure. The duration of the whole procedure was approximately 4 hours and varied little between the 2 groups. However, as expected, the duration of the hilar dissection was shorter in the "glissonean" approach group ($P < 0.001$). By contrast, the duration of pedicular clamping time was shorter in the hilar dissection group ($P = 0.015$). No differences were observed in the amount of hemorrhage or the volume of crystalloid administered. Only 16 patients underwent transfusion intraoperatively (20%) without any differences being recorded between groups. The amount of packed red blood cell (PRBC) units in these patients was very low (median, 2 U). The use of preoperative autologous blood donation before liver resections was used in 25 patients with no differences between groups.[16] However, during the stay in the recovery room, several patients underwent transfusion with an overall transfusion rate in 34 of 80 patients (42.5%). The proportion of patients requiring blood transfusion, and the number of PRBC transfused, were also similar in the 2 groups (Table 3).

Complications

No intraoperative deaths occurred. The mortality rate within 30 days was 1.25% (1 of 80 patients). There was 1 postoperative death as a result of hepatic insufficiency and

TABLE 2. Operative Characteristics of the Patients

	Hilar Dissection (n = 40)	Glissonean Approach (n = 40)	*P* Value
Mean specimen weight (g ± SD)	814 ± 345	875 ± 279	0.41
No. of tumoral nodules, median (range)	2 (1–10)	3 (1–12)	0.4
Type of liver resection, no. (%)			0.56
Extended right hepatectomy	7 (17.5)	8 (20)	
Extended left hepatectomy	3 (7.5)	4 (10)	
Right hepatectomy	24 (60)	18 (45)	
Left hepatectomy	6 (15)	10 (25)	
Associated surgical procedures, no. (%)	10 (25)	15 (38)	0.15
Parenchymal transection			0.49
Crushing clamp, no. (%)	22 (55)	25 (62)	
Ultrasonic dissector, no. (%)	18 (45)	15 (37.5)	
Margin invasion, no. (%)	4 (10)	5 (12.5)	0.72

SD, standard deviation.

cerebral anoxia in the hilar dissection group. Fatal complications did not occur and surgical injury of the contralateral biliary duct was not observed. However, 21 patients (26%) presented some type of surgical complications. Seven patients presented a biliary fistula that resolved spontaneously. Two patients in group 1 were reoperated because of early postoperative abdominal evisceration. Other complications observed in group 1 were ascites and paralytic ileus. In group 2 other complications included upper gastrointestinal hemorrhage, fever of unknown origin, catheter sepsis, ventricular fibrillation, paralytic ileus (n = 2), cerebrovascular accident, and ascites. Postoperative hospital stay was also similar (median, 9 days). The rate of in-hospital readmittance was 9% (7 of 80 patients) and was linked to the treatment of postoperative complications: in group 1 drainage of pleural effusion, intraabdominal fluid collection, and bile leak; in

TABLE 3. Results of Intraoperative Variables

	Hilar Dissection (n = 40)	Glissonean Approach (n = 40)	*P* Value
Overall operative time (mean ± SD, min)	247 ± 54	236 ± 43	0.42
Duration of liver mobilization	61 ± 26	61 ± 22	0.97
Duration of hilar section	70 ± 26	50 ± 17	0.0001
Duration of liver transection	56 ± 19	63 ± 26	0.17
Duration of hemostasis	60 ± 17	64 ± 18	0.27
Ischemic duration (mean ± SD, min)	43 ± 15	51 ± 15	0.015
Median (range)	41.5 (0–67)	49.5 (9–86)	0.04
Intraoperative blood loss (mean ± SD, mL)	887 ± 510	937 ± 636	0.71
Transfusion requirements (intraoperative)			
Patients transfused, no. (%)	6 (15)	10 (25)	0.26
Packets red cell units (mean ± SD)	1.83 ± 0.75	2.4 ± 1.1	0.28
Normovolemic hemodilution, no. (%)	15 (37.5)	10 (25)	0.23
Transfusion requirements (overall)			
Patients transfused, no. (%)	14 (35)	20 (50)	0.17
Packets red cell units (mean ± SD)	3.07 ± 1.77	2.85 ± 2.41	0.77
Crystalloid perfused (mean ± SD, mL)	2915 ± 1316	3027 ± 1325	0.75

SD, standard deviation; normovolemic hemodilution, preoperative autologous blood donation before liver resections.

TABLE 4. Complications and Hospital Evolution

	Hilar Dissection (n = 40)	Glissonean Approach (n = 40)	*P* Value
Complications, no. (%)	8 (20)	13 (32.5)	0.2
Wound infection	2 (5)	4 (10)	0.4
Subphrenic abscess	0 (0)	2 (5)	0.15
Bile leak	3 (7.5)	4 (10)	0.7
Hepatic insufficiency	1 (1.5)	4 (10)	0.2
Reoperation*	2 (5)	0 (0)	0.1
Other complications†	2 (5)	8 (20)	0.04
In-hospital stay, (days, mean ± SD)	9.45 ± 4.12	11.7 ± 6.65	0.73
Median (range days)	8 (6–24)	9 (5–31)	0.6
In-hospital death	1	0	0.31
In-hospital readmittance	3 (7.5)	4 (10)	0.7

*Two patients in group 1 were reoperated because of early postoperative abdominal evisceration.
†Other complications observed in group 1 were ascites and paralytic ileus. Other complications observed in group 2 were upper gastrointestinal hemorrhage, fever from unknown origin, catheter sepsis, ventricular fibrillation, paralytic ileus (n = 2), cerebrovascular accident, and ascites.

group 2 drainage of intraabdominal fluid collections (n = 2), cholangitis, and hepatic abscess (Table 4). Levels of ALT on postoperative days 1 and 2 were significantly higher in group 2. The evolution of postoperative aspartate transaminase (AST), bilirubin, and prothrombin time were similar between groups (Fig. 3).

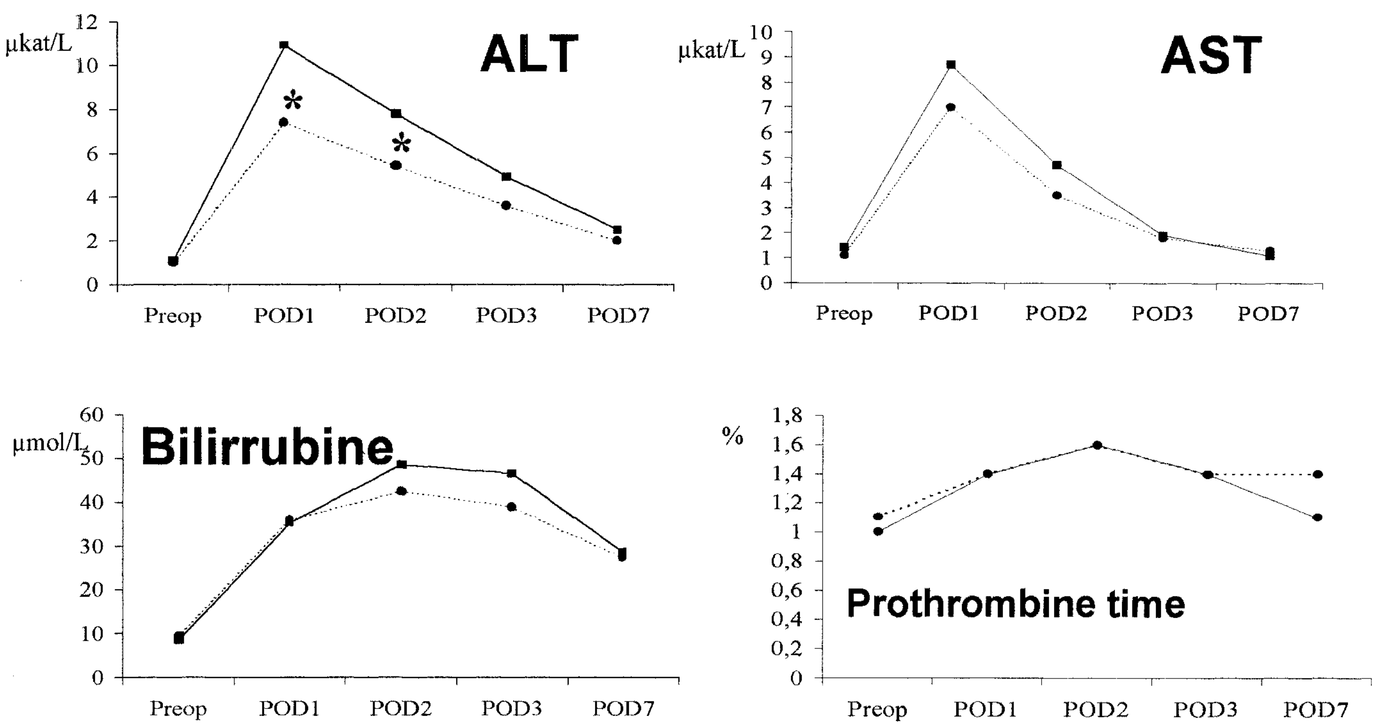

FIGURE 3. Postoperative evolution of ALT (μKat/L).* The levels on postoperative days 1 and 2 were significantly higher in the "glissonean" approach group ($P < 0.05$). ALT normal value < 0.9 μKat/L. Postoperative evolution of AST (μKat/L), normal value < 0.6 μKat/L. Postoperative evolution of bilirubin (μmol/L), normal value = 6-20 μmol/L. Postoperative evolution of prothrombin time. INR normal value = 0.8-1.2. Group 1 (——). Group 2(_____).

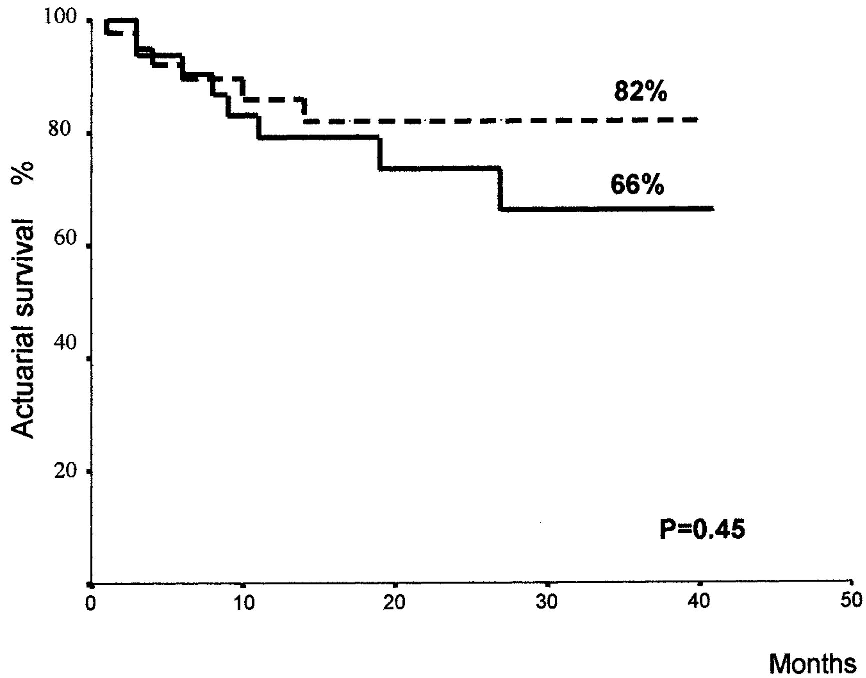

FIGURE 4. The actuarial survival, with a median follow up of 15 months, showed no differences between the groups. Group 1 (- - - - -). Group 2(——).

The cost of the surgical material, excluding the material used by the anesthesia team, was $1235.8 US for the hilar dissection group and $1301 US for the "glissonean" approach.

Actuarial survival, with a median follow up of 15 months, showed no differences between the groups (Fig. 4).

DISCUSSION

The aim of this study was to confirm previous reports that the "glissonean" approach of the hilum together with vascular stapling can reduce the portal triad closure time and might expedite the transection of the liver, eliminating the risk of incidental lesion of anomalous hepatic vessels or the surgical injury of the contralateral biliary duct.[8] Our results demonstrate that both techniques tested are equally effective procedures for treating the hilar structures. The overall operative times were similar. However, the *en bloc* stapling transection of the hilar structures was found to be faster than the isolated ligature of each element in the pedicle. The longer operative period for patients in group 1 during the hilar dissection could be related to the longer time needed to dissect each element, to disclose any anomalous variations in the hepatic arteries, and to close the portal vein stump using a running suture. Yet, hilar dissection is associated with a shorter pedicular clamping time, probably because an initial period of Pringle maneuver was used in the "glissonean" approach to carry out the hepatotomy for the introduction of the stapler. However, inflow occlusion is not always necessary when performing the minor hepatotomy required to encircle the main right or left portal triad. In the "glissonean" approach group, liver transection time was longer, as was duration of hemostasis, although this was not significant. Differences could relate to the cross-sectional area required for transection, which differs based on patient size, liver/size, body habitus, and so on. The higher levels of ALT during postoperative days 1 and 2, in the "glissonean" approach group, might also be related to the longer pedicular clamping time. This study also demonstrates that surgical bleeding, transfusion rate, and the amount of PRBC transfused were very low, and that they did not differ greatly between the 2 groups. The rates of surgical complications, in particular biliary fistulas, were also very low and similar rates were reported in the 2 groups. One of the main concerns of this study was the possibility that the "glissonean" approach might have led to an increase in the rate of bile leaks, as has been previously reported.[10] This complication might be the result of the presence of bile ducts in the caudate lobe and their frequent drainage into the left bile duct. To avoid this complication, the TA 30 stapling machine must be introduced carefully, preserving all the branches leading to the caudate lobe, when segment I is to be preserved.

The "glissonean approach" has been reported as presenting certain disadvantages. For example, accidental ligation of the biliary confluence has been described when stapling the right pedicle, presenting postoperatively as obstructive jaundice.[7] To avoid this complication, firm countertraction on the tape must be applied during application of the stapler to ensure that the confluence of the bile duct is not accidentally ligated. One patient in this study was shifted from "glissonean" approach to hilar dissection because tumor margin violation occurred near the portal pedicle during hepatotomy. This technique should not, therefore, be used if the tumor lies near the right or left portal pedicle. If the right side of the liver is quite large, or there is an extremely large metastasis or another tumor present, making the perihilar incision in hepatic substance can be difficult. In such circumstances, the more traditional extrahepatic approach to the pedicle structures should be used. On the other hand, "the glissonean" approach might be extremely useful in reoperations when the hepatic pedicle has already been dissected to avoid damaging anatomic variations or contralateral structures.

In conclusion, in experienced hands, the techniques are equally effective procedures for treating the hilar structures. Thus, the amount of bleeding and blood transfusion, overall operative time, and complications are largely similar. Although the *en bloc* stapler transection of the pedicle was more rapidly undertaken, hilar dissection is associated with shorter pedicular clamping, lower postoperative levels of ALT, and the surgical materials were less expensive.

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